

Feasibility Demonstration of a Multi-Cylinder Stirling Convertor with a Duplex Linear Alternator, Phase I

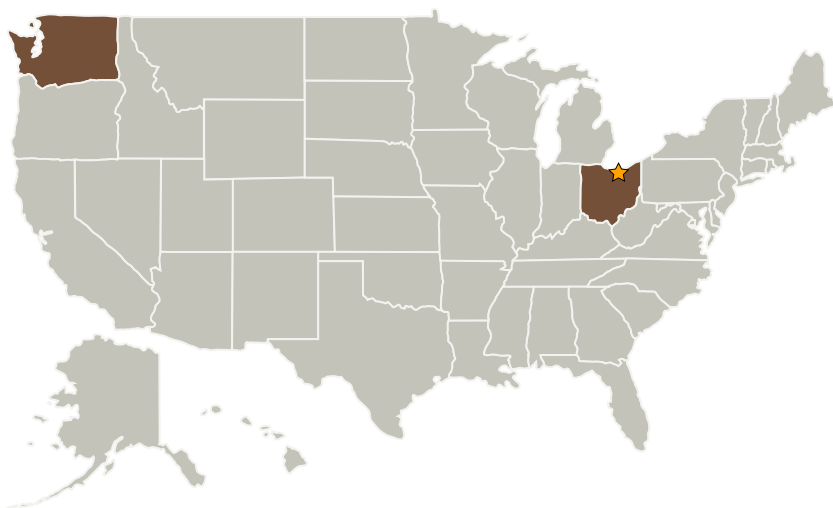
Completed Technology Project (2004 - 2004)



Project Introduction

Stirling Technology Company (STC) proposes to integrate an existing Multi-Cylinder Free-Piston Stirling Engine (MPFPSE) with innovative compact linear alternators. Future manned and unmanned scientific and exploration missions will require substantially more electric power from nuclear, solar, and other heat sources than existing launch-capable systems can effectively provide. A scalable, cost-effective, safe, reliable, low mass, robust, high-efficiency, heat-to-electric power convertor is proposed. Innovative aspects include: 1) increased power density through the use of a double-acting MCFPSE, 2) increased system efficiency by improving phase angle and reducing alternator losses, and 3) an innovative duplex linear alternator design with the potential to improve efficiency and reduce mass. This advanced dynamic power system for heat-to-electric power conversion is based on a free-piston implementation of the well-known Siemens four-cylinder heat exchanger interconnection arrangement combined with highly reliable, flexure-supported linear alternators. These proven technologies provide high power density, while retaining the simplicity and long-life inherent with flexure-supported hardware, as evidenced by an on-going 79,000-hour (9-year) maintenance-free, degradation-free endurance test at STC. Power convertors based on this innovative arrangement are scalable up to tens of kilowatts, while modular combinations of coaxially-aligned, opposed power convertors will produce very low net vibration forces.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Stirling Technology Company	Supporting Organization	Industry	KENNEWICK, Washington

Primary U.S. Work Locations

Ohio	Washington
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Songgang Qiu

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.1 Power Generation and Energy Conversion
 - └ TX03.1.4 Dynamic Energy Conversion